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CLAIMS

What is claimed is:

1. A multiple band transceiver that allows for
10 frequency scaling of an input signal while utilizing a reduced
number of frequency sources, the transceiver comprising:

a first frequency source operative to generate a first
oscillating signal;

a back-end transmitter mixer, electrically coupled to
said first frequency source, operative to receive said first
oscillating signal and an unmodulated transmit signal and to
generate an Intermediate Frequency (IF) transmit signal;

a back-end receiver mixer, electrically coupled to said
first frequency source, operative to receive said first
oscillating signal and an IF receive signal and to generate an
unmodulated receive signal;

a second frequency source operative to generate a second
oscillating signal, wherein said second oscillating signal can
correspond to a first band when said transceiver is operating
25 in a first mode or a second band when said transceiver is
operating in a second mode;

5 a front-end transmitter mixer electrically coupled to
said second frequency source, operative to receive said second
oscillating signal and said IF transmit signal, to produce a
Radio Frequency (RF) transmit signal that corresponds to said
first band when said transceiver is operating in said first
10 mode and corresponds to said second band when said transceiver
is operating in said second mode; and

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a front-end receiver mixer electrically coupled to the
second frequency source, operative to receive said second
oscillating signal and an RF receive signal associated with
said first band when said transceiver is operating in said
first mode and associated with said second band when said
transceiver is operating in said second mode, to generate said
IF receive signal.

5 2. The multiple band transceiver of claim 1, wherein
when operating in said first band, said front-end receiver
mixer further comprises:

an RF receive input for receiving said RF receive signal,
an IF receive output, and said front-end receiver mixer being
10 operative to combine said RF receive signal with said second
oscillating signal to produce said IF receive signal.

3. The multiple band transceiver of claim 1, wherein
when operating in said first band, said back-end receiver
mixer further comprises:

an IF receive input for receiving said IF receive signal
associated with said first band, an unmodulated receive
output, and said back-end receiver mixer being operative to
combine said IF receive signal and said first oscillating
20 signal to produce said unmodulated receive signal.

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5 4. The multiple band transceiver of claim 1, wherein
when operating in said first band, said back-end transmitter
mixer further comprises:

an unmodulated transmit input for receiving said
unmodulated transmit signal, an IF transmit output, and said
10 back-end transmitter mixer being operative to combine said
unmodulated transmit signal and said first oscillating signal
to produce said IF transmit signal.

5. The multiple band transceiver of claim 1, wherein
when operating in said first band, said front-end transmitter
mixer further comprises:

an IF transmit input for receiving said IF transmit
signal, an RF transmit output, and said front-end transmitter
mixer being operative to combine said IF transmit signal
20 corresponding to said first band and said second oscillating
signal to produce said RF transmit signal corresponding to
said first band.

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5 6. The multiple band transceiver of claim 1, wherein
when operating in said second band, said front-end receiver
mixer further comprises:

an RF receive input for receiving said RF receive signal,
an IF receive output, and said front-end receiver mixer being
10 operative to combine said RF receive signal and said scaled
second oscillating signal to produce said IF receive signal.

7. The multiple band transceiver of claim 1, wherein
when operating in said second band, said back-end receiver
mixer further comprises:

an IF receive input for receiving said IF receive signal,
an unmodulated receive output, and said back-end receiver
mixer being operative to combine said IF receive signal and
said first oscillating signal to produce said unmodulated
20 receive signal.

5 8. The multiple band transceiver of claim 1, wherein
when operating in said second band, said back-end transmitter
mixer further comprises:

an unmodulated transmit input for receiving said
unmodulated transmit signal, an IF transmit output, and said
10 back-end transmitter mixer being operative to combine said
unmodulated transmit signal and said first oscillating signal
to produce said IF transmit signal.

9. The multiple band transceiver of claim 1, wherein
when operating in said second band, said front-end transmitter
mixer further comprises:

an IF transmit input for receiving said IF transmit
signal, an RF transmit output, and said front-end transmitter
mixer being operative to combine said IF transmit and said a
20 second oscillating signal to produce said RF transmit signal
corresponding to said second band.

10. The dual band transceiver of claim 1, further
comprising a programming mechanism which enables said second
25 frequency source to be programmable to operate in said first
and said second band.

5 11. The dual band transceiver of claim 1, wherein said
first band is a cellular band and said second band is a PCS
band.

10 12. The dual band transceiver of claim 1, wherein said
first band is a GSM band and said second band is a DCS1800
band.

13. The dual band transceiver of claim 1, wherein the
second oscillator is in a phase-locked loop configuration, and
said phase-locked loop includes a voltage doubler device, for
extending the tuning range of said second oscillator and
reducing the signal to noise ratio.

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5 14. A radio telephone, having a dual band receiver for
operating in a first band and a second band, said dual band
receiver comprising:

 a first frequency source operative to generate a first
oscillating signal;

10 a second frequency source operative to generate a second
oscillating signal;

 a front-end receiver mixer, having a Radio Frequency (RF)
receive input for receiving an incoming RF receive signal, an
oscillating signal input electrically coupled to said second
frequency source and operative to receive said second
oscillating signal when operating in said first band, a scaled
oscillating signal input electrically coupled to said second
oscillating signal through a scaler for receiving a scaled
second oscillating signal when operating in said second band,
20 and an Intermediate Frequency (IF) receive output for
providing an IF receive signal generated by combining said
incoming RF signal with said second oscillating signal when
operating in said first band and for providing said IF receive
signal generated by combining said incoming RF signal with
25 said scaled second oscillating signal when operating in said
second band; and

5 a back-end receiver mixer, having an IF receive input for
receiving said IF receive signal, an oscillating input
electrically coupled to said first frequency source and
operative to receive said first oscillating signal, and an
unmodulated receive output for providing an unmodulated
10 receive signal generated by combining said IF receive signal
with said first oscillating signal.

15. The radio telephone of claim 14, wherein said dual
band receiver further comprises a programming mechanism which
enables said receiver to be programmable to operate in said
first band and said second band.

16. The radio telephone of claim 14, wherein said second
frequency source further comprises a programming mechanism
20 which enables said receiver to be programmable to operate in
said first band and said second band.

17. The radio telephone of claim 14, wherein said first
band is a cellular band and said second band is a PCS band.

18. The radio telephone of claim 14, wherein said first
band is a GSM band and said second band is a DCS1800 band.

5 19. A radio telephone, having a dual band transmitter
for transmitting in a first band and a second band, said dual
band transmitter comprising:

 a first frequency source operative to generate a first
oscillating signal;

10 a second frequency source operative to generate a second
oscillating signal;

 a back-end transmitter mixer, having an unmodulated
transmit input for receiving an unmodulated transmit signal,
an oscillating signal input electrically coupled to said first
frequency source and operative to receive said first
oscillating signal, and an Intermediate Frequency (IF) transmit
output for providing an IF transmit signal by combining said
unmodulated transmit signal and said first oscillating signal;
and

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5 a front-end transmitter mixer, having an IF transmit
input for receiving an IF transmit signal, an oscillating
signal input electrically coupled to the second frequency
source and operative to receive said second oscillating signal
when operating in said first band, a scaled oscillating signal
10 input electrically coupled to the second frequency source
through a scaler and operative to receive a scaled second
oscillating signal when operating in said second band, and an
RF transmit output for providing an RF transmit signal
generated by combining said IF transmit signal and said second
15 oscillating signal when operating in said first band and for
providing said RF transmit signal generated by combining said
IF transmit signal and said scaled second oscillating signal
when operating in said second band.

20 20. The radio telephone of claim 19, wherein said dual
band transmitter further comprises a programming mechanism
which enables said dual band transmitter to be programmable to
operate in said first band and said second band.

5 21. The radio telephone of claim 19, wherein said second
frequency source further comprises a programming mechanism
which enables said dual band transmitter to be programmable to
operate in said first band and said second band.

10 22. The radio telephone of claim 19, wherein said first
band is a cellular band and said second band is a PCS band.

23. The radio telephone of claim 19, wherein said first
band is a GSM band and said second band is one of the
following bands:

- (a) DCS1800 band;
- (b) cellular band; and
- (c) PCS band.

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5 24. A radio telephone, having a dual band transceiver
for transmitting and receiving in a first band and a second
band, said first band and said second band each having a
receive and a transmit channel, the dual band transceiver
comprising:

10 a first frequency source operative to generate a first
oscillating signal;

 a first frequency scalar, having an oscillating signal
input electrically coupled to said first frequency source for
receiving said first oscillating signal, and a scaled
oscillating signal output for providing a first scaled first
oscillating signal;

20 a first transmitter mixer, having an unmodulated transmit
input for receiving an unmodulated transmit signal, a first
frequency scalar input electrically coupled to said first
frequency scalar for receiving said first scaled first
oscillating signal, and an IF transmit output generated by
combining said unmodulated transmit signal and said first
scaled first oscillating signal;

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5 a second transmitter mixer, having an unmodulated
transmit input for receiving an unmodulated transmit signal, a
first frequency scaler input electrically coupled to said
first frequency scalar for receiving said first scaled first
oscillating signal having a 90 degree phase shift, and an IF
10 transmit output for providing an IF transmit signal generated
by combining said unmodulated transmit signal and said first
scaled first oscillating signal with said 90 degrees phase
shift;

a second frequency source operative to generate a second
oscillating signal, wherein said second frequency source is
programmable to operate in said first band and said second
band;

10 a third transmitter mixer, having an IF transmit input
electrically coupled to said first and said second mixer for
receiving said IF transmit signal generated by summing said IF
transmit signal from said first mixer and said second mixer,
an oscillating signal input electrically coupled to said
second frequency source for receiving said second oscillating
signal when operating in said first band, and an RF transmit
25 output for providing an RF transmit signal generated by
combining said IF transmit signal and said second oscillating
signal when operating in said first band;

5 a second frequency scalar, having an oscillating signal input electrically coupled to the second frequency source for receiving a second oscillating signal, and a scaled oscillating signal output for providing a scaled second oscillating signal; and

10 a fourth transmitter mixer, having an IF transmit input electrically coupled to said first and said second mixer for receiving said IF transmit signal generated by summing said IF transmit signal from said first mixer and said second mixer, a oscillating signal input electrically coupled to said second frequency source through said second frequency scalar for receiving said scaled second oscillating signal when operating in said second band, and an RF transmit output for providing an RF transmit signal generated by combining said IF transmit signal and said scaled second oscillating signal when
20 operating in said second band.

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5 25. The radio telephone of claim 24, wherein said dual
band transceiver further comprises:

 a first receiver mixer, having a Radio Frequency (RF)
receive input for receiving an RF receive signal input, an
oscillating signal input electrically coupled to said second
10 frequency source for receiving said second oscillating signal
when operating in said first band, an IF receive output for
providing a first IF receive signal generated by combining
said second oscillating signal with said RF receive signal
when operating in said first band;

15 a second receiver mixer, having a Radio Frequency (RF)
receive input for receiving an RF receive signal, an
oscillating signal input electrically coupled to said second
scaler for receiving said scaled second oscillating signal
when operating in said second band, an IF receive output for
20 providing an IF receive signal generated by combining said
scaled second oscillating signal with said RF receive signal
when operating in said second band;

25 a third frequency scaler, having an oscillating signal
input electrically coupled to said first frequency source for
receiving said first oscillating signal, and a scaled first
oscillating signal output for providing a second scaled first
oscillating signal;

5 a third receiver mixer, having a scaled oscillating
signal input electrically coupled to said third frequency
scaler for receiving said second scaled first oscillating
signal, an IF receive input for receiving said first IF
receive signal, and a second IF receive output for providing a
10 second IF receive signal generated by combining said second
scaled first oscillating signal and said first IF receive
signal;

5 a fourth frequency scaler, having an oscillating signal
input electrically coupled to said first frequency source for
receiving a first oscillating signal, a scaled oscillating
signal output for providing a third scaled first oscillating
signal;

5 a fourth receiver mixer, having a second IF input
electrically coupled to said third receiver mixer for
20 receiving said second IF signal, an oscillating signal input
electrically coupled to said fourth frequency scaler for
receiving said third scaled first oscillating signal, and an
unmodulated receive output for providing an unmodulated
receive signal generated by combining said second IF signal
25 and said third scaled first oscillating signal; and

5 a fifth receiver mixer, having a second IF input
electrically coupled to said third receiver mixer for
receiving said second IF signal, an oscillating signal input
electrically coupled to said fourth frequency scaler for
receiving said third scaled first oscillating signal having a
10 90 degree phase shift, and an unmodulated receive output for
providing an unmodulated receive signal generated by combining
said second IF signal and said third scaled first oscillating
signal having said 90 degree phase shift.

26. The dual band transceiver of claim 25, further
comprising a programming mechanism which enables said receiver
to be programmable to operate in the first and the second
band.

20 27. The dual band transceiver of claim 25, wherein said
second frequency source further comprises a programming
mechanism which enables said receiver to be programmable to
operate in the first and the second band.

5 28. The dual band transceiver of claim 25, wherein said
first band is a cellular band and said second band is a PCS
band.

10 29. The radio telephone of claim 25, wherein said first
band is a GSM band and said second band is one of the
following bands:

- (a) DCS1800 band;
- (b) cellular band; and
- (c) PCS band.

20 30. A method of operating a dual band transceiver device
that allows for frequency scaling of a signal while utilizing
a reduced number of frequency sources, the method comprising:
generating a first oscillating signal;
generating a second frequency signal;
if said dual band transceiver device is operating in said
first band, further performing the following steps:

- receiving an unmodulated transmit signal;
- generating an IF transmit signal by combining said
unmodulated transmit signal and said first oscillating
signal;
- generating an RF transmit signal corresponding to
said first band by combining said IF transmit signal and
said first oscillating signal;

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